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7 JP10-127563

Image probe

Publication Number	Date filed	Status	Title	Inventors	Translation
JP10-127563	October 30, 1996	Applic.	Endoscope Unit	Ozawa*	Machine, Derwent

7.1 DESCRIPTION

7.1.1 Summary:

This patent deals with design features of an autofluorescence endoscopic imaging system. It describes an invention that addresses the issues of image quality and "user friendliness" of such systems. This patent is predicated on the use of a videoendoscope (as opposed to the fiberoptic endoscope) for white light imaging. The primary novel feature of this invention is that fluorescence imaging is performed by using the videoendoscope to provide illumination of the body cavity under observation and that the resulting image is acquired through a fiber optic image probe that is separate from the videoendoscope.

7.1.2 Detailed Description of First Embodiment

[0008] – [0013] Figures 1 & 2

The first embodiment describes a fluorescence endoscopic imaging system based on the use of a videoendoscope for white light imaging. The system consists of a light source capable of providing either white or blue light, a videoendoscope and video processor for illumination and white light image acquisition, a separate fiber optic image guide and fluorescence camera and processor for fluorescence image acquisition, and a controller/video signal display selector and display monitor.

The light source contains a lamp (examples given include metal halide lamp) and a blue (400 –450 nm is given as an example) filter that can be switched into the optical path between the lamp and the videoendoscope light guide by a mode-switching controller.

The videoendoscope contains a CCD at it's distal tip for acquiring high resolution white light images. A video processor processes the white light image signals from this CCD. At the operator end, the videoendoscope contains an operator interface for controlling the switching between white light and fluorescence imaging modes. Finally, the videoendoscope also contains a channel through, which a fiberoptic image probe can be inserted for fluorescence imaging purposes

The fiberoptic image probe contains a single coherent fiber image bundle. The proximal end of the probe is connected to a fluorescence camera containing a shutter and a high sensitivity image sensor. The shutter is employed to prevent accidental exposure of the high sensitivity image sensor to potentially damaging white light. Images acquired with this sensor are encoded as video signals and are processed by a second video processor.

The outputs of the two video processors are fed into a video signal display selector/controller, which selects, which signal is to be displayed on the monitor. Alternatively, the two signals may be displayed

simultaneously in a picture-in-picture format. (Under such circumstances, one signal would be supplied from an image memory device not specified). The display selector/controller also controls the imaging mode of the rest of the system by ensuring that the filter in the light source and the shutter in the fluorescence camera are in the appropriate positions and by controlling the operation of the two video processors.

The claimed advantages of this embodiment over previously described endoscopic fluorescence imaging systems are:

1. The size and weight of the proximal end of the videoendoscope remains easier to manipulate since fluorescence camera can be mounted remotely
2. The quality of the white light image is improved through the use of a videoendoscope for the white light image acquisition.
3. Since illumination for both imaging modes is provided by the videoendoscope light guide, the fiber optic image probe is dedicated to imaging only and does not have to compromise the coherent image bundle size to include a separate illumination guide (such as is the case when a complete smaller fiberoptic endoscope, or "baby endoscope", is used for such a purpose)
4. Such an imaging system has a broader and more flexible application, since it can also be used with a fiberoptic endoscope (instead of a videoendoscope), if only fluorescence endoscopy is to be carried out.

7.1.3 Detailed Description of Second Embodiment

[0014] – [0016] Figure 3

The second embodiment of this invention incorporates a modification to the light source. In this embodiment, the white light is generated by a lamp such as a Xenon, halogen or metal halide lamp, but the blue light is generated by a laser such as a helium cadmium, dye or semiconductor laser. The coupling of blue or white light to the videoendoscope light guide is determined by the positioning of a rotating mirror. A controller receiving switch signals from the operator interface on the videoendoscope, adjusts the position of the mirror and directs one or the other beams into the light guide. The lamp, laser, rotating mirror and controller are all contained within the light source.

Alternative configurations also claimed include:

An operator interface on the light source instead of the videoendoscope

An operator interface that is detachable from the videoendoscope

An endoscope with two-channels instead of one for the purposes of biopsy/treatment

An endoscope in which an image sensor is installed in the ocular (proximal end) of the endoscope

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(54) [Title of the Invention]

ENDOSCOPE DEVICE

translated by Derwent
Jan 24/00

(57) [Abstract]

[Object] The object of the present invention is to provide an endoscope device [a] which has good operating characteristics without causing any increase in the size of the ocular part of the endoscope, [b] in which switching between ordinary observation and fluorescent observation can be accomplished by means of a simple operation, and [c] in which high-quality fluorescent observation images with a sufficient resolution can be obtained.

[Solution] [The present invention provides] an endoscope device which is equipped with [a] an endoscope 1, [b] a light source device 4 which is capable of emitting an exciting light that causes the illuminating light transmission means 3 of the aforementioned endoscope 1 to generate fluorescence in body tissues, [c] a probe 11 which can be passed through the channel of the aforementioned endoscope 1, and which has an optical image transmission means 12 in its inserted portion, and [d] a high-sensitivity image pickup means 15 which is connected to the handle end of the aforementioned probe 11, and which picks up an image of the imaged object that is transmitted from the aforementioned optical image transmission means 12.

[Claims]

[Claim 1] An endoscope device which is characterized by the fact that said device comprises [a] an endoscope, [b] a light source device which is capable of emitting an exciting light that causes the illuminating light transmission means of the aforementioned endoscope to generate fluorescence in body tissues, [c] a probe which can be passed through the channel of the aforementioned endoscope, and which has an optical image transmission means in its inserted portion, and [d] a high-sensitivity image pickup means which is connected to the handle end of the aforementioned probe, and which picks up an image of the imaged object that is transmitted from the aforementioned optical image transmission means.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention concerns an endoscope device which is capable of selectively performing ordinary observation and fluorescent observation in which the interiors of body cavities are illuminated with an exciting light so that fluorescent images are obtained.

[0002]

[Prior Art] In Japanese Patent Application Kokai No. Hei 7-222712, a fluorescent observation device is disclosed which uses a mother-daughter scope type endoscope in which a slender endoscope is inserted and used inside the channel of [another] endoscope. A light source device

used for ordinary observation, which generates a white illuminating light, is connected to the mother scope, so that ordinary observation images can be obtained. Furthermore, an exciting laser apparatus is connected to the daughter scope, so that fluorescent observation images can be obtained. In other words, the device has a construction n which fluorescent observation can be performed by means of the slender daughter scope.

[0003] Furthermore, an endoscope device which is capable of selectively performing ordinary observation and fluorescent observation is disclosed in Japanese Patent Application Kokai No. Hei 7-155290. An illuminating light switching means which selectively switches between illuminating light from a light source used for ordinary observation and exciting light from a light source used for fluorescent observation, and which conducts [the selected light] to the light guide of the endoscope, is provided; furthermore, an image pickup device switching means is installed in the ocular part of the endoscope, and selective switching is performed between an ordinary observation image pickup means and a fluorescent observation image pickup means by the abovementioned switching means, so that observation images are obtained.

[0004]

[Problems to Be Solved by the Invention] However, in the case of the construction disclosed in Japanese Patent Application Kokai No. Hei 7-222712, an image guide which transmits the image and a light guide which transmits the exciting laser [light] are essential in the daughter scope, while at the same time, the external diameter of this daughter scope is limited to a diameter which allows insertion into the channel of the endoscope. As a result, it is impossible to maintain a sufficient diameter in both the image guide and light guide. Accordingly, it is difficult to insure a sufficient resolution in the fluorescent observation images. Furthermore, two light source devices are required, i. e., a white illuminating light source for ordinary observation and an exciting laser light source for fluorescent observation; as a result, the size of the apparatus is increased.

[0005] Furthermore, in the case of the construction disclosed in Japanese Patent Application Kokai No. Hei 7-155290, an image intensifier or rotating filter is installed inside the image pickup means used for fluorescent observation; as a result, it is difficult to reduce the size of this fluorescent observation image pickup means, so that the image pickup device connected to the ocular part of the endoscope is unavoidably large. Specifically, such endoscopes are held by physicians performing operations; consequently, the connection of a large image pickup device to the ocular part greatly increase the burden on the operating physician. Furthermore, this also causes a severe deterioration in the operating characteristics, and is therefore extremely undesirable. Furthermore, since the image pickup means used for ordinary observation is connected to the ocular part of the endoscope, the optical image that is subjected to photoelectric conversion by this image pickup means must be an optical image that arrives via an image guide fiber. However, optical images that travel via an image guide fiber are images with a poor resolution. In other words, a photoelectrically converted image obtained by installing an image pickup means in the tip end portion of the endoscope and focusing the image on this image pickup means using an objective lens alone, without causing the image to pass through an mage guide fiber at all, has a sufficiently high resolution.

[0006] The present invention was devised in light of the above facts. The object of the present invention is to provide an endoscope device [a] which has good operating characteristics without causing any increase in the size of the ocular part of the endoscope, [b] in which switching between ordinary observation and fluorescent observation can be accomplished by means of a simple operation, and [c] in which high-quality fluorescent observation images with a sufficient resolution can be obtained.

[0007]

[Means Used to Solve the Abovementioned Problems] The endoscope device of the present invention is characterized by the fact that said device comprises: [a] an endoscope, [b] a light source device which is capable of emitting an exciting light that causes the illuminating light transmission means of the aforementioned endoscope 1 to generate fluorescence in body tissues, [c] a probe which can be passed through the channel of the aforementioned endoscope, and which has an optical image transmission means in its inserted portion, and [d] a high-sensitivity image pickup means which is connected to the handle end of the aforementioned probe, and which picks up an image of the imaged object that is transmitted from the aforementioned optical image transmission means.

[0008]

[Working Configurations of the Invention] Working configurations of the present invention will be described below with reference to the attached figures. Figures 1 through 3 illustrate a first working configuration of the present invention. Figure 1 is an overall structural diagram of the endoscope device. Figure 2 is a sectional view of the insertion part of the probe used for fluorescent observation. Figure 3 is a structural diagram which illustrates a modification of the light source device.

[0009] In the endoscope device shown in Figure 1, the endoscope 1 has an objective lens system and an image pickup means (not shown in the figures) in the tip end portion of said endoscope. An optical image from the object being imaged is focused on this image pickup means, and a photoelectric conversion is performed. The image signal obtained as a result of this photoelectric conversion is sent to a video processor 2 which is connected to the endoscope 1 via a signal line (not shown in the figures). This signal is subjected to signal processing, and is converted into a television video signal. Furthermore, a light guide fiber 3 which transmits the illuminating light is installed inside the endoscope 1, and an illumination lens (not shown in the figures) is installed at the tip end of this light guide fiber 3. The handle end of the light guide fiber 3 is passed through a universal cord, and is connected to a light source device 4. This light source device 4 has a light source lamp 5 that emits white light, an optical filter 6 which is disposed between the light source lamp 5 and light guide fiber 3 in such a manner that said filter 6 can be freely inserted or removed, and a switching control part 7 that controls the insertion and removal of this optical filter 6. A xenon lamp, halogen lamp or metal halide lamp, etc., may be appropriately used as the light source lamp 5. The optical filter 6 is a band-pass filter that allows only wavelengths in a specified region to pass through, e. g., a filter that allows light at wavelengths of

400 nm to 450 nm to pass through. A switch 9 is installed in an operating part 8 on the handle end of the endoscope 1, and switching signals output from this switch 9 are transmitted to the switching control part 7 inside the light source device.

[0010] A channel 10 which allows the insertion of treatment tools is formed in the endoscope 1. The insertion part 11a of the probe 11 used for fluorescent observation is constructed with an external diameter that allows the insertion of this part into the abovementioned channel 10. As is shown in Figure 2, [this insertion part 11a] is constructed from an image guide fiber 12 and an outer covering tube 13 that covers the circumference of the image guide fiber 12. An objective lens system (not shown in the figures) is installed in the tip end portion of the fluorescent observation probe 11, and the handle end of this probe 11 is connected to a high-sensitivity image pickup unit 14. A high-sensitivity image pickup element 15 and a shutter 16 which is disposed between the high-sensitivity image pickup element 15 and the image guide fiber 12 are installed inside the high-sensitivity image pickup unit 14, and the opening-and-closing action [of the shutter 16] is controlled in response to control signals from the switching control part 7. Since the fluorescence generated by the exciting light is weak, a high-sensitivity image pickup element is essential. Furthermore, the connection part 17 between the fluorescent observation probe 11 and the high-sensitivity image pickup unit 14 has a construction that allows free rotation in the direction of the optical axis, so that the orientation of the image displayed on the TV monitor can be freely adjusted.

[0011] A video processor part 19 which processes the image signals produced by the photoelectric conversion performed by the high-sensitivity image pickup element 15, and an output signal control part 20, are installed in the image processing device 18. In the output signal control part 20, the switching of the images displayed on the monitor TV 21 is performed in response to control signals output form the switching control part 7 on the basis of switching signals output from the switch 9 installed in the operating part 8 of the endoscope 1.

[0012] Next, the operation of this working configuration will be described. In cases where ordinary observation is to be performed, the light source lamp 5 is lit in a state in which the optical filter 6 is withdrawn from the light path of the illuminating light, and the living tissue that is the object of imaging is imaged under this white illuminating light by the image pickup element that is installed in the tip end portion of the endoscope. The image signal thus acquired is subjected to signal processing by the video processor 2, and is thus converted into a television video signal. This television video signal is displayed as an ordinary observation image on the monitor TV 21 in response to control signals from the switching control part 7 inside the light source device 4. In this case, the shutter 16 installed in front of the high-sensitivity image pickup element 15 is closed, thus preventing unnecessary strong light from striking the element and having a deleterious effect. Meanwhile, in cases where fluorescent observation is to be performed, the switch 9 installed in the operating part 8 of the endoscope 1 is operated so that a switching signal is sent to the switching control part 7. In response to this switching signal, the switching control part 7 actuates a switching mechanism (not shown in the figures) installed in the optical filter 6 of the light source device 4, so that the optical filter 6 is inserted into the light path of the illuminating light. As a result of passing through the optical filter 6, the white light is sent into the light guide 3 as light with a wavelength of (e. g.) 400 nm to 450 nm, and is directed

onto the object of imaging as exciting light. Furthermore, control signals from the switching control part 7 are respectively sent to the high-sensitivity image pickup element 15 inside the high-sensitivity image pickup unit 14, the shutter 16, the video processing part 19 inside the image processing device 18, and the output signal control part 20. The shutter 16 is opened in response to a control signal from the switching control part 7, and an optical image of the object of imaging is focused on the high-sensitivity image pickup element 15. In response to a control signal from the switching control part 7, the high-sensitivity image pickup element 15 is switched to a state that allows image pickup, and the image signal produced by photoelectric conversion is converted into a television video signal by the video processing part 19. This signal is displayed on the monitor TV via the output signal control part 20. The orientation of the displayed image in the direction of rotation of the image can be adjusted as desired by rotating the fluorescent observation probe 11 and high-sensitivity image pickup unit 14 by means of the connection part 17. Furthermore, in regard to the displayed image, either an ordinary observation image or a fluorescent observation image can be selectively displayed as was described above. Moreover, both types of images can be simultaneously displayed using a TV in TV system. In this case, the images may also be images read out from an image memory (not shown in the figures).

[0013] In the present working configuration, a construction is used in which the high-sensitivity image pickup means which constitutes an unavoidably large image pickup device is installed in the handle end of the fluorescent observation probe 11. Accordingly, there is no increase in the size of the ocular part of the endoscope held by the physician performing the operation, and the operating characteristics can be greatly improved. Furthermore, in the case of ordinary observation, photoelectric conversion is performed by the image pickup means installed in the tip end portion of the endoscope; accordingly, high-quality images that have a high resolution can be obtained. In addition, since white light for ordinary observation and exciting light for fluorescent observation can be selectively emitted within the light source device, a reduction in the size of the apparatus can also be realized. Furthermore, in cases where diagnoses that involve the combined use of fluorescent observation are to be performed, if only the fluorescent observation probe and the light source device that is capable of selectively emitting white light or exciting light used for fluorescent observation are provided as new parts, an ordinary endoscope can be used. Accordingly, a highly efficient endoscope system with extremely good all-purpose characteristics can be realized.

[0014] Next, a modification of the light source device of the present invention will be described with reference to Figure 3. In Figure 3, only the construction of the light source device shown in Figure 1 is different.

[0015] A white light source lamp 32 which emits white light used for ordinary observation, and a laser light source 33 which emits laser light as exciting light used for fluorescent observation, are installed in the light source device 31 shown in Figure 3. A xenon lamp, halogen lamp or metal halide lamp, etc., may be appropriately used as the light source lamp 32. Furthermore, examples of lasers that can be used include helium-cadmium lasers, dye lasers and semiconductor lasers. A mirror 34 is installed between the white light source lamp 32 and laser light source 33, and the light guide fiber 3. This mirror 34 is constructed so that it is free to rotate about a rotating shaft 35. In cases where the mirror 34 is positioned in the state indicated

by the solid line in Figure 3, laser light is emitted. On the other hand, when the mirror 34 is positioned in the state indicated by the broken line in Figure 3, white light is emitted. A switching mechanism (not shown in the figures) is actuated by the switching control part 7 in response to switching signals output from the switch 9 installed in the operating part 8 of the endoscope 1, so that a switching operation of the mirror is performed. The remaining operations and effects are the same as in the first working configuration.

[0016] Furthermore, it would also be possible to install the switch 9 in the light source device 4 instead of in the operating part 8 of the endoscope 1; moreover, it would also be possible to use an independent switch, and to use a construction in which this switch can be freely attached to or detached from the endoscope 1. Furthermore, in cases where an endoscope with two channels is used, it would also be possible to insert the fluorescent observation probe into one of the channels, and to insert a treatment instrument such as examination forceps, etc., into the other channel, so that treatment can be performed under fluorescent observation. Furthermore, it would also be possible to construct an endoscope in which an image pickup means is installed in the ocular part of the endoscope.

[0017] As was described above in detail, the following constructions can be obtained using working configurations of the present invention.

[Appended Claim 1] An endoscope device which is characterized by the fact that said device comprises [a] an endoscope, [b] a light source device which is capable of emitting an exciting light that causes the illuminating light transmission means of the aforementioned endoscope to generate fluorescence in body tissues, [c] a probe which can be passed through the channel of the aforementioned endoscope, and which has an optical image transmission means in its inserted portion, and [d] a high-sensitivity image pickup means which is connected to the handle end of the aforementioned probe, and which picks up an image of the imaged object that is transmitted from the aforementioned optical image transmission means.

[Appended Claim 2] The endoscope device [Translator's note: original actually reads "endoscope insertion", but this appears to be an error.] claimed in Appended Claim 1, which is characterized by the fact that the aforementioned endoscope has an image pickup means in the tip end of its inserted portion.

[Appended Claim 3] The endoscope device claimed in Appended Claim 1, which is characterized by the fact that the aforementioned light source device is capable of selectively emitting white light and exciting light.

[Appended Claim 4] The endoscope device claimed in Appended Claim 1, which is characterized by the fact that a shutter means is installed between the aforementioned high-sensitivity image pickup means and the object of imaging.

[Appended Claim 5] The endoscope device claimed in Appended Claim 3, which is characterized by the fact that a switch is provided, and a switching controls means is provided

which performs switching between the aforementioned white light and exciting light on the basis of switching signals output from the aforementioned switch.

[Appended Claim 6] The endoscope device claimed in Appended Claim 4, which is characterized by the fact that a switch is provided, and a switching control means is provided which controls the opening and closing of the aforementioned shutter on the basis of switching signals output from the aforementioned switch.

[Appended Claim 7] The endoscope device claimed in Appended Claim 1, which is characterized by the fact that [a] said device has [i] a first video processing means which processes the image pickup signal from the image pickup means installed in the tip end of the inserted portion of the aforementioned endoscope, and converts this signal into a television signal, and [ii] a second video processing means which processes the image pickup signal from the aforementioned high-sensitivity image pickup means, and converts this signal into a television signal, and [b] an output control means is provided which selectively switches the television signals output from the abovementioned first and second video processing means, and outputs these signals to a monitor TV.

[Appended Claim 8] The endoscope device claimed in Appended Claim 7, which is characterized by the fact that a switch is provided, and the television signals output from the aforementioned output control means are switched on the basis of switching signals output from this switch.

[Appended Claim 9] The endoscope device claimed in Appended Claims 5, 6 and 8, which is characterized by the fact that at least two control actions among the aforementioned control actions of [a] switching control of the aforementioned white light and exciting light performed by the aforementioned switching control means, [b] opening and closing control of the aforementioned shutter means, and [c] switching control of the television signals output form the aforementioned output control means, are performed in a synchronized manner.

[Appended Claim 10] The endoscope device claimed in Appended Claims 5, 6 and 8, which is characterized by the fact that the aforementioned switch is installed in the operating part of the aforementioned endoscope.

[0018]

[Merits of the Invention] In the present invention, as was described above, a construction is used in which the high-sensitivity image pickup means which constitutes an unavoidably large image pickup device is installed in the handle end of the fluorescent observation probe. Accordingly, there is no increase in the size of the ocular part of the endoscope held by the physician performing the operation, and the operating characteristics can be greatly improved. Furthermore, since the fluorescent observation probe requires no light guide, the diameter of the image guide can be increased by a corresponding amount; accordingly, fluorescent observation images can be obtained as high-quality images. Furthermore, in cases where diagnoses involving the combined use of fluorescent observation are to be performed, if only the fluorescent

observation probe and the light source device that is capable of selectively emitting white light or exciting light used for fluorescent observation are provided as new parts, an ordinary endoscope can be used. Accordingly, a highly efficient endoscope system with extremely good all-purpose characteristics can be realized.

[Brief Description of the Drawings]

[Figure 1] Figure 1 is an overall structural diagram of an endoscope device constituting a first working configuration of the present invention.

[Figure 2] Figure 2 is a sectional view of the insertion part of fluorescent observation probe in a first working configuration of the present invention.

[Figure 3] Figure 3 is a structural view of a modification of the light source device in a first working configuration of the present invention.

[Explanation of Symbols]

1 Endoscope
4 Light source device
11 Fluorescent observation probe
15 High-sensitivity image pickup element

[insert Figures]

DERWENT

MACHINE-ASSISTED TRANSLATION (MAT):

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(57)【要約】

(57)[SUMMARY]

【課題】
内視鏡接眼部の大型化を招くことがなく操作性が良好で、簡便な操作で通常観察と蛍光観察を切換えることが出来、かつ、充

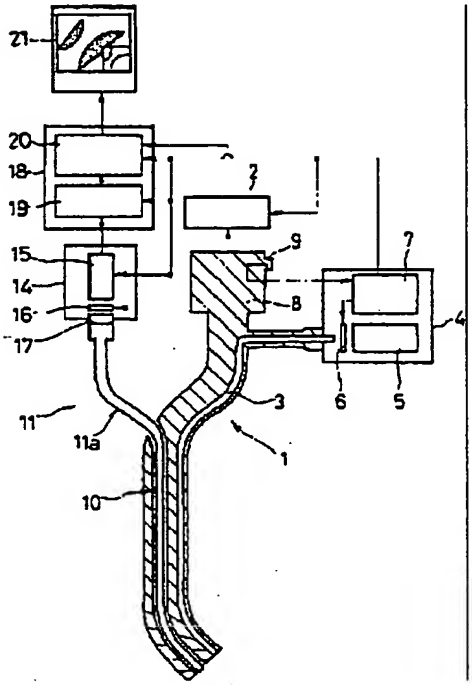
[SUBJECT]
Enlargement of an endoscope eye-piece part is not caused, operativity is good, and it can switch between usual observation and fluorescent observation by simple operation.

分な解像度を有する高画質の蛍光観察画像を得ることができる内視鏡装置を提供する。

【解決手段】
内視鏡１と、この内視鏡１の照明光伝送手段３に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置４と、前記内視鏡１のチャンネル内に挿通可能でその挿入部に光学像伝送手段１２を有するプローブ１１と、このプローブ１１の手元側に接続され前記光学像伝送手段１２から伝送された被写体像を撮像する高感度撮像手段１５と、を具備する内視鏡装置とする。

And, the endoscope apparatus which can obtain the high-resolution fluorescent observation image which has sufficient image resolution is provided.

[SOLUTION]
An endoscope apparatus comprising endoscope 1, with the light-source equipment 4 which can irradiate light, the excitation light which makes an internal tissue generate fluorescence for the illumination light transmission means 3 of this endoscope 1, it can pass through the channel of the above-mentioned endoscope 1 for probe 11 which has the optical image transmission means 12 in the insertion part, high-sensitivity imaging means 15 to record the photographic-subject image which was connected to the front side of this probe 11, and was transmitted from the above-mentioned optical image transmission means 12.



【特許請求の範囲】

【請求項１】
内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とする内視鏡装置。

[CLAIMS]

[CLAIM 1]
An endoscope apparatus comprising an endoscope, the excitation light which make illumination optical-transmission means of this endoscope generate a fluorescence to internal tissue with the light source device, in which a radiation is possible. The probe which can pass through the channel of the above-mentioned endoscope, and has optical image transmission means in the insertion part, High-sensitivity image-pick-up means to image-pick up the copied object image which was connected to the front side of this probe and was transmitted from above-mentioned optical image transmission means.

【発明の詳細な説明】

【0001】

【発明の属する技術分野】
本発明は、通常観察と、体腔内に励起光を照射して蛍光像を得る蛍光観察とを選択的に行うことのできる内視鏡装置に関する。

【0002】

【従来の技術】
特開平７－２２２７１２号公報において、図２５には、内視鏡のチャンネル内に細径の内視鏡を挿入して使用する親子スコープ型の内視鏡を用いた蛍光観察装置が開示されている。親スコープには白色照明光を発生する通常観察用光源装置が接続されており、通常観察画像を得ることができる。また、子スコープには、励起用レーザ装置が接続されており、蛍光観察画像を得ることができる。即ち、細径の子スコープで蛍光観察を行う構成となっている。

【0003】

[DETAILED DESCRIPTION OF INVENTION]

[0001]

[TECHNICAL FIELD]
This invention relates to the endoscope apparatus which can perform selectively usual and fluorescent observation which irradiates excitation light to an intra-corporeal region and obtains a fluorescent image.

[0002]

[PRIOR ART]
In the Provisional-Publication-No. 7-222712 gazette, the fluorescent observation apparatus using the main and sub scope type endoscope which inserts and uses the endoscope of a narrow diameter in the channel of an endoscope is disclosed in Diagram 25.

The usual light source device for observation which generates a white illumination light is connected to the outer scope, and a usual observation image can be obtained.

Moreover, the laser apparatus for excitation is connected to the inner scope, whereby fluorescent observation image can be obtained.

That is, it is the composition to obtain fluorescent observation with the child scope of a narrow diameter.

[0003]

また、特開平７－１５５２９０号公報には、蛍光観察と通常観察とを選択的に行える内視鏡装置が開示されている。光源として、通常観察用光源からの照明光と蛍光観察用光源からの励起光とを選択的に切り換えて内視鏡のライトガイドに導く照明光切り換え手段を設ける一方、内視鏡の接眼部に撮像装置切換手段を設け、この切換手段によって通常観察用撮像手段と蛍光観察用撮像手段とを選択的に切換えて、観察画像を得る。

Moreover, the endoscope apparatus which can perform fluorescent observation and a fluorescent usual observation selectively is disclosed by the Provisional-Publication-No. 7-155290 gazette.

While providing illumination light change means which the illumination light from the usual light source for observation and the excitation light from the fluorescent light source for observation are switched selectively, and is guided to the light guide of the endoscope as a light source, image-pick-up apparatus switching means is provided in the eye-piece part of an endoscope.

Usual image-pick-up means for observation and fluorescent image-pick-up means for observation are selectively switched by this switching means, and the observation image is obtained.

【０００４】

[0004]

【発明が解決しようとする課題】

しかしながら、特開平７－２２２７１２号公報に開示された構成では、子スコープに、画像を伝送するイメージガイドと励起用レーザを伝送するライトガイドとが必須である一方、その外径は内視鏡のチャンネル内に挿入できる太さに制限されていることから、イメージガイド、ライトガイドともに充分な太さを確保することができない。従っ

[PROBLEM ADDRESSED]

However using the composition disclosed by the Provisional-Publication-No. 7-222712 gazette, since the outer diameter is limited to the size which can be inserted into the channel of an endoscope while the image guide which transmits an image to a child scope, and the light guide which transmits the laser for excitation is indispensable, the image guide and a light guide cannot secure sufficient size.

Therefore, it was difficult to secure image resolution sufficient as fluorescent observation image.

て、蛍光観察画像として充分な解像度を確保することが困難であった。さらに、光源装置は、通常観察のための白色照明光と蛍光観察のための励起レーザの２台が必要であり、装置の大型化を招いていた。

Furthermore, 2 sets, the white illumination light for a usual observation and excitation laser for fluorescent observation, are required for the light source device, and the expansion of the apparatus was caused.

【０００５】
また、特開平７－１５５２９０号公報に開示された構成では、蛍光観察用撮像手段の内部にイメージインテンシファイアあるいは回転フィルタを設けるため蛍光観察用撮像手段を小型化することは困難であり、内視鏡の接眼部に接続される撮像装置が大型のものとならざるを得ない。即ち、内視鏡は、術者である医師が保持するものであり、接眼部に大型の撮像装置を接続することは、術者の負担を大幅に増加させ、また、その操作性をも著しく悪化させることとなり、きわめて好ましくない。さらに、通常観察撮像手段は内視鏡接眼部に接続されているため、その撮像手段で光電変換される光学像はイメージガイドファイバを経由して来た光学像とならざるを得ないものの、イメージガイドファイバを経由した光学像は解像度に乏しい像となってしまう宿命にある。換言すれば、内視鏡先端部に撮像手段を設け、イメージガイドファイ

[0005]
Moreover, in order to provide an image intensifier or a rotating filter inside fluorescent image-pick-up means for observation with the composition disclosed by the Provisional-Publication-No. 7-155290 gazette, it is difficult to reduce the size of the fluorescent image-pick-up means for observation, and the image-pick-up apparatus connected to the eye-piece part of an endoscope must be large-sized.

That is, the doctor who is an operator maintains an endoscope, and connecting a large-sized image-pick-up apparatus to the eye-piece part makes the burden on the operator increase sharply.

Moreover, operativity is also aggravated remarkably, and it was not very desirable.

Furthermore, since usual observation image-pick-up means is connected to the endoscope eye-piece part, the optical image by which a photoelectric conversion is carried out with the image-pick-up means must be the optical image which comes out via the image guide fibre.

But, the optical image which went via image guide fibre has the fate of being an image deficient in image resolution.

In other words, image-pick-up means is provided on the endoscope end, and it does not

バを全く経由することなく対物レンズ系のみで撮像手段に結像させて光電変換した画像の方が充分に高い解像度を有している。

go via the image guide fibre at all.

The direction of the image which image-pick-up means was made to image-form, and carried out the photoelectric conversion only by the objective-lens group has the sufficiently high image resolution.

【0006】

本発明は上記事情に鑑みてなされたものであり、内視鏡接眼部の大型化を招くことがなく操作性が良好で、簡便な操作で通常観察と蛍光観察を切換えることが出来、かつ、充分な解像度を有する高画質の蛍光観察画像を得ることができる内視鏡装置を提供することを目的としている。

[0006]

This invention is made in view of the above-mentioned situation.

Enlargement of the endoscope eye-piece part is not caused, and operativity is good and it can switch between usual and fluorescent observation by simple operation.

And, it aims at providing the endoscope apparatus which can obtain the high-resolution fluorescent observation image which has sufficient image resolution.

【0007】

[0007]

【課題を解決するための手段】

本発明の内視鏡装置は、内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とするものである。

[SOLUTION OF THE INVENTION]

For the endoscope apparatus of this invention, an endoscope, the excitation light which make illumination optical-transmission means of this endoscope generate a fluorescence in an internal tissue the light source device, in which a radiation is possible, the probe which can pass through the channel of the above-mentioned endoscope, and has optical image transmission means in the insertion part, and high-sensitivity image-pick-up means to image-pick up the copied object image which was connected to the front side of this probe and was transmitted from above-mentioned optical

image transmission means, these are comprised.

It is characterized by the above-mentioned.

【0008】

[0008]

【発明の実施の形態】

以下、図面を参照して本発明の実施の形態を説明する。図1乃至図3は本発明の第1の実施の形態に係り、図1は内視鏡装置の全体構成図、図2は蛍光観察用プローブの挿入部の断面図、図3は光源装置の変形例を示す構成図である。

[Embodiment]

Hereafter, the embodiment of this invention is demonstrated with reference to a drawing.

Fig. 1 or 3 concerns the first embodiment of this invention.

Diagram 1 is an entire block diagram of an endoscope apparatus. Diagram 2 is a sectional drawing of the insertion part of the fluorescent probe for observation. Diagram 3 is a block diagram showing the modification of the light source device.

【0009】

[0009]

図1の内視鏡装置において、内視鏡1は、先端部に図示しない対物レンズ系、撮像手段を有しており、被写体からの光学像をこの撮像手段に結像させて光電変換を行う。光電変換された画像信号は図示しない信号線を経由して内視鏡1に接続されたビデオプロセッサ2に伝送され、信号処理されてテレビジョン映像信号への信号変換が行われる。また、内視鏡1内には、照明光を伝送するライトガイドファイバ3が設けられており、ライトガイドファイバ3の先端側には図示しない照明用レンズが

In the endoscope apparatus in diagram 1, endoscope 1 has the objective-lens group not illustrated on the end, and image-pick-up means.

This image-pick-up means is made to image-form the optical image from the photographed object, and a photoelectric conversion is performed.

The image signal by which the photoelectric conversion was carried out is transmitted to the video processor 2 connected to endoscope 1 via the signal line not illustrated.

Signal processing is carried out and the signal conversion to a television video signal is performed.

Moreover, in endoscope 1, light-guide fibre 3

設けられている。ライトガイドファイバ３の手元側は、ユニバーサルコード内を挿通され、光源装置４に接続されている。光源装置４は、白色光を出射する光源ランプ５、光源ランプ５とライトガイドファイバ３との間に挿脱自在に配設された光学フィルタ６、この光学フィルタ６の挿脱を制御する切換制御部７とを有している。光源ランプ５としては、キセノンランプ、ハロゲンランプ、メタルハライドランプ等が適している。光学フィルタ６は特定領域の波長のみを通過せしめるバンドパスフィルタであり、例えば、４００ｎｍ乃至４５０ｎｍの波長の光を通過せしめるものである。内視鏡１の手元側の操作部８には、切換スイッチ９が設けられており、切換スイッチ９から出力される切換信号は、光源装置内の切換制御部７に伝送される。

which transmits an illumination light is provided.

The lens for illumination not illustrated is provided on the end of light-guide fibre 3.

The front side of light-guide fibre 3 is passed through the inside of a universal cord, and it connects with the light source device 4.

The light source device 4 has the optical filter 6 removably installed and the switching control part 7 which controls an installation/removal of this optical filter 6, between the light-source lamp 5, the light-source lamp 5 and light-guide fibre 3 which carry out the radiation of white light.

As light-source lamp 5, the xenon lamp, the halogen lamp, the metal halide lamp, etc. are suitable.

The optical filter 6 is a band-pass filter which passes only the wavelength of a specific area.

For example, wavelength (400 nm or 450 nm) light is passed.

The change-over switch 9 is provided on the operating part 8 on the front of endoscope 1.

The switching signal output from a change-over switch 9 is transmitted to the switching control part 7 in the light source device.

【００１０】

内視鏡１には処置具を挿入可能なチャンネル１０が設けられている。蛍光観察用プローブ１１の挿入部１１ａは、このチャンネル１０内に挿入可能な外径寸法に構成されており、図２に示すように、イメージガイドファイバ１２およびその外周を被覆する外皮チューブ１３とで構成

[0010]

channel 10 which can insert a treatment tool is provided on endoscope 1.

Insertion-part 11a of the fluorescent probe for observation 11 has the outer-diameter dimension which can be inserted into this channel 10.

As shown in Diagram 2, it consists of image guide fibre 12 and the outer-layer tube 13 which coats the periphery.

されている。蛍光観察用プローブ１１の先端部には図示しない対物レンズ系が設けられており、手元側は高感度撮像ユニット１４に接続されている。高感度撮像ユニット１４内には、高感度撮像素子１５、高感度撮像素子１５とイメージガイドファイバ１２との間に配設されたシャッタ１６が設けられており、切換制御部７からの制御信号に対応して開閉が制御される。励起光によって発生する蛍光は微弱であるため、高感度の撮像素子は必須である。また、蛍光観察用プローブ１１と高感度撮像ユニット１４との接続部１７は、光軸方向に回転自在な構成となっており、ＴＶモニタに表示する画像の向きを任意に調整可能である。

The objective-lens group not illustrated is provided on the end of the fluorescent probe for observation 11.

The front side is connected to the high-sensitivity image-pick-up unit 14.

In the high-sensitivity image-pick-up unit 14, shutter 16 arranged between the high-sensitivity image-pick-up element 15, the high-sensitivity image-pick-up element 15, and image guide fibre 12 is provided.

An switching is controlled corresponding to the control signal from the switching control part 7.

Since the fluorescence generated by excitation light is slight, the image-pick-up element of high sensitivity is indispensable.

Moreover, connection 17 of the fluorescent probe for observation 11 and the high-sensitivity image-pick-up unit 14 serves as composition rotatable in the direction of the optical axis, and the direction of the image displayed in the TV monitor can be adjusted arbitrarily.

【００１１】

画像処理装置１８には、高感度撮像素子１５で光電変換された画像信号を処理するビデオプロセス部１９、出力信号制御部２０が設けられている。出力信号制御部２０では、内視鏡１の操作部８に設けられた切換スイッチ９から出力された切換信号に基づいて切換制御部７から出力される制御信号に対応して、モニタＴＶ２１に表示する画像の

[0011]

The video processor 19 which processes the image signal by which the photoelectric conversion was carried out with the high-sensitivity image-pick-up element 15, and the output signal-control part 20 are provided on the image processing device 18.

In the output signal-control part 20, it corresponds to the control signal output from the switching control part 7 based on the switching signal output from the change-over switch 9 provided on the operating part 8 of an

切り換えを行う。

endoscope 1, and the switch of the image displayed to monitor TV21 is performed.

【００１２】

次に、この実施の形態の作用を説明する。通常観察を行う場合には、光学フィルタ６が照明光の光路から退避した状態で光源ランプ５を点灯させ、この白色照明光下で、被写体である生体組織を内視鏡先端部に設けられた撮像素子で撮像する。撮像された画像信号は、ビデオプロセッサ２で信号処理されてテレビジョン映像信号に変換される。このテレビジョン映像信号は、光源装置４内の切換制御部７からの制御信号に対応して、モニタＴＶ２１に通常観察画像として表示される。この時、高感度撮像素子１５の前に設けられたシャッタ１６は、閉じられており、不要な強い光が素子に入射して悪影響が及ぶのを防止している。一方、蛍光観察を行う場合には、内視鏡１の操作部８に設けられた切換スイッチ９を操作して、切換制御部７に切換信号を送出する。切換制御部７は、この切換信号に対応して光源装置４の光学フィルタ６に設けられた図示しない切換機構を動作させて、光学フィルタ６を照明光の光路内に挿入せしめる。白色光は、光学フィルタ６を通過することにより、例えば４００

[0012]

Next, the effect of this embodiment is demonstrated.

When performing a usual observation, the optical filter 6 makes the light-source lamp 5 light in the state where it retreated from the optical path of an illumination light.

The organism tissue which is a photographed object under this white illumination light is recorded with the image-pick-up element provided on the endoscope end.

The signal processing of the image signal recorded is carried out by the video processor 2, and conversion is carried out to a television video signal.

This television video signal is equivalent to a control signal from the switching control part 7 in a light source device 4.

Monitor TV21 displays as a usual observation image.

At this time, shutter 16 provided before the high-sensitivity image-pick-up element 15 is closed.

It has prevented that a strong unnecessary light incidents to an element, causing bad influence.

On the one hand, in performing fluorescent observation, it operates the change-over switch 9 provided on the operating part 8 of an endoscope 1, and a switching signal is sent out to the switching control part 7.

The switching control part 7 operates the switching device which was provided on the

ｎｍ乃至４５０ｎｍの波長の光としてライトガイド３に送出され、励起光として被写体に照射される。また、切換制御部７からの制御信号は、高感度撮像ユニット１４内の高感度撮像素子１５、シャッタ１６、画像処理装置１８内のビデオプロセス部１９、出力信号制御部２０にそれぞれ伝送される。シャッタ１６は、切換制御部７からの制御信号に対応して開かれるとともに、被写体からの光学像が高感度撮像素子１５に結像される。高感度撮像素子１５は、切換制御部７からの制御信号に対応して撮像可能な状態に切り換えられ、光電変換された画像信号は、ビデオプロセス部１９でテレビジョン映像信号に変換され、出力信号制御部２０を経てモニタＴＶに表示される。表示される画像は、接続部１７で蛍光観察用プローブ１１と高感度撮像ユニット１４とを回転させることにより画像の回転方向の向きを所望の向きとすることができる。なお、表示する画像は、以上述べたように通常観察画像と蛍光観察画像を選択的に表示しても良く、ＴＶｉｎＴＶ方式で両方の画像を同時に表示するようにしても良い。この場合、画像は、図示しない画像メモリから読み出した画像としても良い。

optical filter 6 of a light source device 4 corresponding to this switching signal and not illustrated.

The optical filter 6 is made to insert into the optical path of an illumination light.

White light is sent out to a light guide 3, for example, as wavelength (400 nm or 450 nm) of a light by passing the optical filter 6, and it is irradiated by the photographed object as excitation light.

Moreover, the control signal from the switching control part 7 is respectively transmitted to the high-sensitivity image-pick-up element 15 in the high-sensitivity image-pick-up unit 14, shutter 16, the video processor 19 in an image processing device 18, and the output signal-control part 20.

While shutter 16 is opened corresponding to the control signal from the switching control part 7, the optical image from a photographed object is image-formed with a high-sensitivity image-pick-up element 15.

The high-sensitivity image-pick-up element 15 is switched to the state which can be recorded, corresponding to the control signal from the switching control part 7.

conversion of the image signal by which the photoelectric conversion was carried out is carried out to a television video signal in the video processor 19, and monitor TV displays through the output signal-control part 20.

The image displayed can make the rotation direction of the image a desired direction by rotating the fluorescent probe for observation 11, and the high-sensitivity image-pick-up unit 14 by connection 17.

In addition, the image to display may display selectively a usual observation image and fluorescent observation image, as stated above.

It may be made to display both of images by TVinTV system simultaneously.

In this case, an image is good also as a read image from the image memory not illustrated.

【００１３】

本実施の形態によれば、大型の撮像装置とならざるをえない高感度撮像手段を蛍光観察用プローブ１１の手元側に設ける構成としたので、術者である医師が保持する内視鏡接眼部の大型化を一切招くことがなく、操作性を大きく向上することができる。また、通常観察は内視鏡先端部に設けられた撮像手段で光電変換するので、解像度が高い高画質な画像として得ることができ、かつ、蛍光観察用プローブもライトガイドが不要である分イメージガイドを太径化することができるので、蛍光観察画像も高画質な画像として得ることができる。さらに、光源装置内で通常観察用の白色光と蛍光観察用の励起光とを選択的に出射することができるので、装置の小型化も実現することができる。また、蛍光観察を併用する診断を行うにあたって、白色光と蛍光観察用の励起光とを選択的に出射可能な光源装置および

[0013]

Since it was considered as the composition which provides high-sensitivity image-pick-up means which must be a large-sized image-pick-up apparatus to the front side of the fluorescent probe for observation 11 according to this embodiment, enlargement of the endoscope eye-piece part which the doctor who is an operator maintains is not caused, and operativity can be improved greatly.

Moreover, since a photoelectric conversion is carried out with image-pick-up means provided on the endoscope end, a usual observation can be obtained as a high-resolution image with a high image resolution.

And, since the fluorescent probe for observation can also make big-diameter the part image guide that does not need a light guide, fluorescent observation image can also be obtained as a high-resolution image.

Furthermore, since the radiation of white light for a usual observation and the excitation light for fluorescent observation can be selectively carried out within the light source device, a size-reduction of the apparatus is also realizable.

Moreover, when performing a diagnosis

蛍光観察用プローブのみを新規に用意すれば、内視鏡は通常のものを流用すれば良いので、きわめて汎用性の高い効率的な内視鏡システムを実現することができる。

which uses fluorescent observation at the same time, if only the light source device in which a radiation is selectively possible, and the fluorescent probe for observation are prepared newly the white light and the excitation light for fluorescent observation, since a conventional endoscope may be used, it can materialize the efficient endoscope system with very broad general purpose.

【００１４】
次に、本発明の光源装置の変形例を図３を参照して説明する。図３は、図１に示した光源装置の構成のみが異なるものである。

[0014]
Next, the modification of the light source device of this invention is demonstrated with reference to Diagram 3.

Only the composition of the light source device which showed Diagram 3 in Diagram 1 differs.

【００１５】
図３の光源装置３１には、通常観察用の白色光を出射する白色光源ランプ３２、蛍光観察のための励起光としてのレーザ光を出射するレーザ光源３３が設けられている。光源ランプ３２は、キセノンランプ、ハロゲンランプ、メタルハライドランプ等が適している。また、レーザとして、ヘリウムカドミウムレーザ、色素レーザ、半導体レーザが挙げられる。白色光源ランプ３２とレーザ光源３３およびライトガイドファイバ３との間には、ミラー３４が配置されている。ミラー３４は、回転軸３５を中心に回動自在に構成されてお

[0015]
The laser light source 33 which carries out the radiation of the laser light as excitation light for the white light-source lamp 32 which carries out the radiation of white light for a usual observation, and fluorescent observation is provided on the light source device 31 in diagram 3.

As for the light-source lamp 32, the xenon lamp, the halogen lamp, the metal halide lamp, etc. are suitable.

Moreover, a helium cadmium laser, a dye laser, and a semiconductor laser are mentioned as a laser.

mirror 34 is configured between the white light-source lamp 32, the laser light source 33, and light-guide fibre 3, and mirror 34 is constituted rotatably focusing on rotation axis

り、ミラー３４が図３に実線で図示されている状態に位置している場合にはレーザ光を出射し、破線で図示されている状態に位置している場合には白色光を出射する。内視鏡１の操作部８に設けられた切換スイッチ９から出力される切換信号に対応して切換制御部７によって図示しない切換機構が動作され、ミラーの切換え動作が行われる。それ以外の作用、効果は、第１の実施の形態と同じである。

35.
When mirror 34 positions in the state where it is illustrated by the continuous line in Diagram 3, the radiation of the laser light is carried out.

When it positions in the state where it is illustrated by the broken line, the radiation of white light is carried out.

The switching device not illustrated by the switching control part 7 corresponding to the switching signal output from the change-over switch 9 provided on the operating part 8 of an endoscope 1 operates, and a change operation of the mirror is performed.

The effect other than that is the same as that of the first embodiment.

【００１６】
なお、切換スイッチ９は、内視鏡１の操作部８ではなく、光源装置４に設けても良い。あるいは、独立したスイッチとしても良く、内視鏡１に着脱自在な構成としても良い。また、２つのチャンネルを有する内視鏡を使用した場合には、そのうちの１つのチャンネル内に蛍光観察用プローブを挿入するとともに、もう１つのチャンネルに生検鉗子等の処置具を挿入して、蛍光観察下での処置を行うこともできる。また、内視鏡接眼部に撮像手段を設けた内視鏡とすることもできる。

[0016]
In addition, a change-over switch 9 may be provided on the light source device 4 instead of operating part 8 of an endoscope 1.

Or, it is good also as an independent switch, and it is good also as a composition detachable from endoscope 1.

Moreover, when using the endoscope which has the channel of two, while inserting the fluorescent probe for observation into the one channel, treatment tools, such as biopsy forceps, are already inserted in the one channel, and the treatment under fluorescent observation can also be performed.

Moreover, it can also use as the endoscope which provided image-pick-up means in the endoscope eye-piece part.

【００１７】
以上詳述したように本発明の実

[0017]
According to the embodiment of this invention,

施態様によれば、以下のような構成を得ることができる。

the following composition can be obtained as explained in full detail above.

【付記項１】
内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とする内視鏡装置。

[Additional-remark item 1]
The endoscope apparatus comprising an endoscope, the excitation light which make an internal tissue generate a fluorescence for illumination optical-transmission means of this endoscope the light source device, in which a radiation is possible, the probe which can pass through the channel of the above-mentioned endoscope, and has optical image transmission means in the insertion part, and high-sensitivity image-pick-up means to image-pick up the copied object image which was connected to the front side of this probe and was transmitted from above-mentioned optical image transmission means.

【付記項２】
前記内視鏡は、挿入部先端部に撮像手段を有することを特徴とする付記項１に記載の内視鏡挿入。

[Additional-remark item 2]
An above-mentioned endoscope has image-pick-up means in the insertion-part end.

Endoscope insertion of the additional-remark item 1 characterized by the above-mentioned.

【付記項３】
前記光源装置は、白色光と励起光とを選択的に出射可能であることを特徴とする付記項１に記載の内視鏡装置。

[Additional-remark item 3]
The radiation is selectively possible for the above-mentioned light source device in white light and excitation light.

The endoscope apparatus of the additional-remark item 1 characterized by the above-mentioned.

【付記項４】
前記高感度撮像手段と被写体との間にシャッタ手段を設けたこ

[Additional-remark item 4]
Shutter means was provided between the above-mentioned high-sensitivity image-pick-up

とを特徴とする付記項1に記載の内視鏡装置。

means and the photographed object.

The endoscope apparatus of the additional-remark item 1 characterized by the above-mentioned.

【付記項5】
切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記白色光と励起光との切換えを行う切換制御手段を設けたことを特徴とする付記項3に記載の内視鏡装置。

[Additional-remark item 5]
A change-over switch is provided.

Switching control means to perform a change with above-mentioned white light and above-mentioned excitation light based on the switching signal output from this change-over switch was provided.

The endoscope apparatus of the additional-remark item 3 characterized by the above-mentioned.

【付記項6】
切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記シヤッタ手段の開閉を制御する切換制御手段を設けたことを特徴とする付記項4に記載の内視鏡装置。

[Additional-remark item 6]
A change-over switch is provided.

Switching control means to control an switching of above-mentioned shutter-means based on the switching signal output from this change-over switch was provided.

The endoscope apparatus of the additional-remark item 4 characterized by the above-mentioned.

【付記項7】
前記内視鏡挿入部先端部に設けられた撮像手段からの撮像信号を処理してテレビジョン信号に変換する第1のビデオプロセス手段と、前記高感度撮像手段からの撮像信号を処理してテレビジョン信号に変換する第2のビデオプロセス手段を有するとともに、この第1および第2のビ

[Additional-remark item 7]
While it has first video process means which the image-pick-up signal from image-pick-up means provided on the above-mentioned endoscope insertion-part end is processed, and carries out conversion to a television signal, and 2nd video process means which the image-pick-up signal from above-mentioned high-sensitivity image-pick-up means is processed, and carries out conversion to a television signal,

デオプロセス手段から出力されるテレビジョン信号を選択的に切換えてモニタTVに出力せしめる出力制御手段を設けたことを特徴とする付記項1に記載の内視鏡装置。

output control means which the television signal output from this 1st and 2nd video process means is switched selectively, and is made to output to monitor TV was provided.

The endoscope apparatus of the additional-remark item 1 characterized by the above-mentioned.

【付記項8】
切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記出力制御手段から出力されるテレビジョン信号を切り換えることを特徴とする付記項7に記載の内視鏡装置。

[Additional-remark item 8]
A change-over switch is provided.

The television signal output from above-mentioned output control means based on the switching signal output from this change-over switch is switched.

The endoscope apparatus of the additional-remark item 7 characterized by the above-mentioned.

【付記項9】
前記切換制御手段による前記白色光と励起光との切り換え制御、前記シャッタ手段の開閉制御、前記出力制御手段から出力されるテレビジョン信号の切り換え制御のうちの少なくとも2つの制御を同期させて行うことを特徴とする付記項5、6および8に記載の内視鏡装置。

[Additional-remark item 9]
It carries out by synchronizing two at least among change control with above-mentioned white light and the above-mentioned excitation light by the above-mentioned switching control means, an switching control of above-mentioned shutter means, and a change control of the television signal output from above-mentioned output control means.

The endoscope apparatus of the additional-remark items 5, 6, and 8 characterized by the above-mentioned.

【付記項10】
前記切換スイッチは、前記内視鏡の操作部に設けたことを特徴とする付記項5、6および8に記載の内視鏡装置。

[Additional-remark item 10]
The above-mentioned change-over switch was provided on the operating part of the above-mentioned endoscope.

The endoscope apparatus of the additional-

remark items 5, 6, and 8 characterized by the above-mentioned.

【００１８】

[0018]

【発明の効果】

以上説明したように本発明によれば、大型の撮像装置とならざるをえない高感度撮像手段を蛍光観察用プローブの手元側に設ける構成としたので、術者である医師が保持する内視鏡接眼部の大型化を一切招くことがなく、操作性を大きく向上することができる。また、蛍光観察用プローブはライトガイドが不要である分イメージガイドを太径化することができるので、蛍光観察画像を高画質な画像として得ることができる。さらに、蛍光観察を併用する診断を行うにあたって、蛍光観察用の励起光を出射可能な光源装置および蛍光観察用プローブのみを新規に用意すれば、内視鏡は通常のものを流用することができるので、きわめて汎用性の高い効率的な内視鏡システムを実現することができる。

[EFFECT OF THE INVENTION]

Since it has the composition whereby the high-sensitivity image-pick-up means that must be a large-sized image-pick-up apparatus as explained above according to this invention is provided on the operator side of the fluorescent probe for observation, enlargement of the endoscope eye-piece part which the doctor who is an operator maintains can be prevented, and operativity can be improved greatly.

Moreover since the fluorescent probe for observation can make big-diameter the image guide since the light guide is unnecessary, the fluorescent observation image can be obtained as a high-resolution image.

Furthermore, when performing a diagnosis using fluorescent observation together, if only the light source device in which a radiation is possible, and the fluorescent probe for observation are prepared the excitation light for fluorescent observation newly, since a conventional endoscope may be used, the efficient endoscope system with very broad general purpose is realizable.

【図面の簡単な説明】

[BRIEF EXPLANATION OF DRAWINGS]

【図１】

本発明の第１の実施の形態の内

[FIGURE 1]

The entire block diagram of the endoscope

視鏡装置の全体構成図。

apparatus of the first embodiment of this invention.

【図２】
本発明の第１の実施の形態の蛍光観察用プローブの挿入部の断面図。

[FIGURE 2]
Sectional drawing of the insertion part of the fluorescent probe for observation of the first embodiment of this invention.

【図３】
本発明の第１の実施の形態の光源装置の変形例を示す構成図。

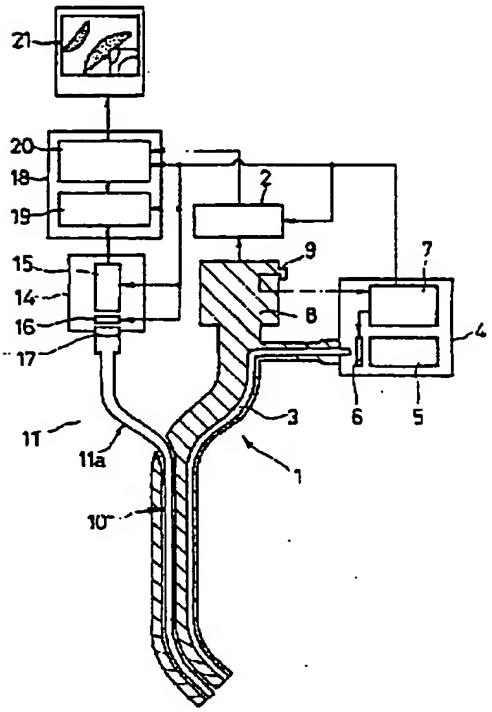
[FIGURE 3]
The block diagram showing the modification of the light source device of the first embodiment of this invention.

【符号の説明】
１　内視鏡
４　光源装置
１１　蛍光観察用プローブ
１５　高感度撮像素子

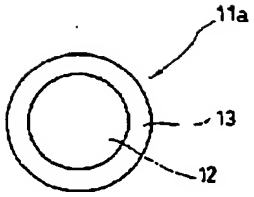
[EXPLANATION OF DRAWING]
1　Endoscope
4　Light Source Device
11　Fluorescent Probe for Observation
15　High-Sensitivity Image-Pick-up Element

【図１】

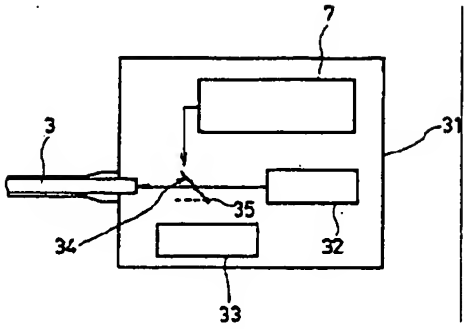
[FIGURE 1]



【図2】 [FIGURE 2]



【図3】 [FIGURE 3]



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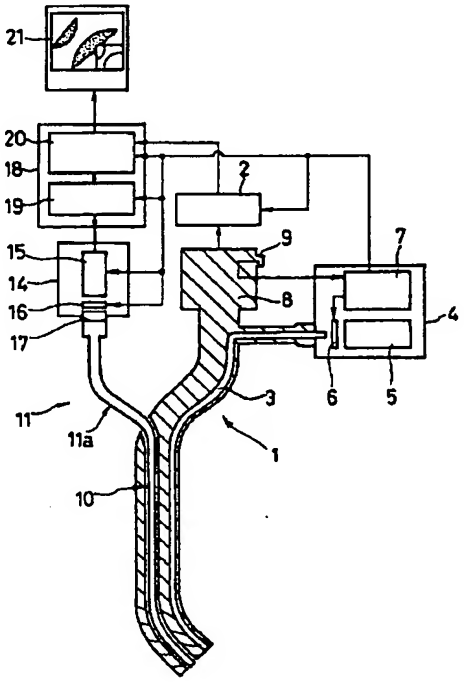
(54)【発明の名称】　内視鏡装置

(57)【要約】

【課題】　内視鏡接眼部の大型化を招くことがなく操作性が良好で、簡便な操作で通常観察と蛍光観察を切換えることが出来、かつ、充分な解像度を有する高画質の蛍光観察画像を得ることができる内視鏡装置を提供する。

【解決手段】　内視鏡１と、この内視鏡１の照明光伝送手段３に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置４と、前記内視鏡１のチャンネル内に挿通可能でその挿入部に光学像伝送手段１２を有するプローブ１１と、このプローブ１１の手元側に接続され前記光学像伝送手段１２から伝送された被写体像を撮像する高感度撮像手段１５と、を具備する内視鏡装置とする。



【特許請求の範囲】
【請求項１】内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とする内視鏡装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、通常観察と、体腔内に励起光を照射して蛍光像を得る蛍光観察とを選択的に行うことのできる内視鏡装置に関する。
【０００２】
【従来の技術】特開平７－２２２７１２号公報において、図２５には、内視鏡のチャンネル内に細径の内視鏡を挿入して使用する親子スコープ型の内視鏡を用いた蛍光観察装置が開示されている。親スコープには白色照明光を発生する通常観察用光源装置が接続されており、通常観察画像を得ることができる。また、子スコープには、励起用レーザ装置が接続されており、蛍光観察画像を得ることができる。即ち、細径の子スコープで蛍光観察を行う構成となっている。
【０００３】また、特開平７－１５５２９０号公報には、蛍光観察と通常観察とを選択的に行える内視鏡装置が開示されている。光源として、通常観察用光源からの照明光と蛍光観察用光源からの励起光とを選択的に切り換えて内視鏡のライトガイドに導く照明光切り換え手段を設ける一方、内視鏡の接眼部に撮像装置切換手段を設け、この切換手段によって通常観察用撮像手段と蛍光観察用撮像手段とを選択的に切換えて、観察画像を得る。
【０００４】
【発明が解決しようとする課題】しかしながら、特開平７－２２２７１２号公報に開示された構成では、子スコープに、画像を伝送するイメージガイドと励起用レーザを伝送するライトガイドとが必須である一方、その外径は内視鏡のチャンネル内に挿入できる太さに制限されていることから、イメージガイド、ライトガイドともに充分な太さを確保することができない。従って、蛍光観察画像として充分な解像度を確保することが困難であった。さらに、光源装置は、通常観察のための白色照明光と蛍光観察のための励起レーザの２台が必要であり、装置の大型化を招いていた。
【０００５】また、特開平７－１５５２９０号公報に開示された構成では、蛍光観察用撮像手段の内部にイメージインテンシファイアあるいは回転フィルタを設けるため蛍光観察用撮像手段を小型化することは困難であり、内視鏡の接眼部に接続される撮像装置が大型のものとならざるを得ない。即ち、内視鏡は、術者である医師が保持するものであり、接眼部に大型の撮像装置を接続することは、術者の負担を大幅に増加させ、また、その操作性をも著しく悪化させることとなり、きわめて好ましくない。さらに、通常観察撮像手段は内視鏡接眼部に接続されているため、その撮像手段で光電変換される光学像はイメージガイドファイバを経由して来た光学像とならざるを得ないものの、イメージガイドファイバを経由した光学像は解像度に乏しい像となってしまう宿命にある。換言すれば、内視鏡先端部に撮像手段を設け、イメージガイドファイバを全く経由することなく対物レンズ系のみで撮像手段に結像させて光電変換した画像の方が充分に高い解像度を有している。
【０００６】本発明は上記事情に鑑みてなされたものであり、内視鏡接眼部の大型化を招くことがなく操作性が良好で、簡便な操作で通常観察と蛍光観察を切換えることが出来、かつ、充分な解像度を有する高画質の蛍光観察画像を得ることができる内視鏡装置を提供することを目的としている。
【０００７】
【課題を解決するための手段】本発明の内視鏡装置は、内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とするものである。
【０００８】
【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。図１乃至図３は本発明の第１の実施の形態に係り、図１は内視鏡装置の全体構成図、図２は蛍光観察用プローブの挿入部の断面図、図３は光源装置の変形例を示す構成図である。
【０００９】図１の内視鏡装置において、内視鏡１は、先端部に図示しない対物レンズ系、撮像手段を有しており、被写体からの光学像をこの撮像手段に結像させて光電変換を行う。光電変換された画像信号は図示しない信号線を経由して内視鏡１に接続されたビデオプロセッサ２に伝送され、信号処理されてテレビジョン映像信号への信号変換が行われる。また、内視鏡１内には、照明光を伝送するライトガイドファイバ３が設けられており、ライトガイドファイバ３の先端側には図示しない照明用レンズが設けられている。ライトガイドファイバ３の手元側は、ユニバーサルコード内を挿通され、光源装置４に接続されている。光源装置４は、白色光を出射する光源ランプ５、光源ランプ５とライトガイドファイバ３との間に挿脱自在に配設された光学フィルタ６、この光学フィルタ６の挿脱を制御する切換制御部７とを有している。光源ランプ５としては、キセノンランプ、ハロゲンランプ、メタルハライドランプ等が適している。光学フィルタ６は特定領域の波長のみを通過せしめるバンドパ

スフィルタであり、例えば、４００ｎｍ乃至４５０ｎｍの波長の光を通過せしめるものである。内視鏡１の手元側の操作部８には、切換スイッチ９が設けられており、切換スイッチ９から出力される切換信号は、光源装置内の切換制御部７に伝送される。

【００１０】内視鏡１には処置具を挿入可能なチャンネル１０が設けられている。蛍光観察用プローブ１１の挿入部１１ａは、このチャンネル１０内に挿入可能な外径寸法に構成されており、図２に示すように、イメージガイドファイバ１２およびその外周を被覆する外皮チューブ１３とで構成されている。蛍光観察用プローブ１１の先端部には図示しない対物レンズ系が設けられており、手元側は高感度撮像ユニット１４に接続されている。高感度撮像ユニット１４内には、高感度撮像素子１５、高感度撮像素子１５とイメージガイドファイバ１２との間に配設されたシャッタ１６が設けられており、切換制御部７からの制御信号に対応して開閉が制御される。励起光によって発生する蛍光は微弱であるため、高感度の撮像素子は必須である。また、蛍光観察用プローブ１１と高感度撮像ユニット１４との接続部１７は、光軸方向に回転自在な構成となっており、ＴＶモニタに表示する画像の向きを任意に調整可能である。

【００１１】画像処理装置１８には、高感度撮像素子１５で光電変換された画像信号を処理するビデオプロセス部１９、出力信号制御部２０が設けられている。出力信号制御部２０では、内視鏡１の操作部８に設けられた切換スイッチ９から出力された切換信号に基づいて切換制御部７から出力される制御信号に対応して、モニタＴＶ２１に表示する画像の切り換えを行う。

【００１２】次に、この実施の形態の作用を説明する。通常観察を行う場合には、光学フィルタ６が照明光の光路から退避した状態で光源ランプ５を点灯させ、この白色照明光下で、被写体である生体組織を内視鏡先端部に設けられた撮像素子で撮像する。撮像された画像信号は、ビデオプロセッサ２で信号処理されてテレビジョン映像信号に変換される。このテレビジョン映像信号は、光源装置４内の切換制御部７からの制御信号に対応して、モニタＴＶ２１に通常観察画像として表示される。この時、高感度撮像素子１５の前に設けられたシャッタ１６は、閉じられており、不要な強い光が素子に入射して悪影響が及ぶのを防止している。一方、蛍光観察を行う場合には、内視鏡１の操作部８に設けられた切換スイッチ９を操作して、切換制御部７に切換信号を送出する。切換制御部７は、この切換信号に対応して光源装置４の光学フィルタ６に設けられた図示しない切換機構を動作させて、光学フィルタ６を照明光の光路内に挿入せしめる。白色光は、光学フィルタ６を通過することにより、例えば４００ｎｍ乃至４５０ｎｍの波長の光としてライトガイド３に送出され、励起光として被写体に照射される。また、切換制御部７からの制御信号は、高感度撮像ユニット１４内の高感度撮像素子１５、シャッタ１６、画像処理装置１８内のビデオプロセス部１９、出力信号制御部２０にそれぞれ伝送される。シャッタ１６は、切換制御部７からの制御信号に対応して開かれるとともに、被写体からの光学像が高感度撮像素子１５に結像される。高感度撮像素子１５は、切換制御部７からの制御信号に対応して撮像可能な状態に切り換えられ、光電変換された画像信号は、ビデオプロセス部１９でテレビジョン映像信号に変換され、出力信号制御部２０を経てモニタＴＶに表示される。表示される画像は、接続部１７で蛍光観察用プローブ１１と高感度撮像ユニット１４とを回転させることにより画像の回転方向の向きを所望の向きとすることができる。なお、表示する画像は、以上述べたように通常観察画像と蛍光観察画像を選択的に表示しても良く、ＴＶｉｎＴＶ方式で両方の画像を同時に表示するようにしても良い。この場合、画像は、図示しない画像メモリから読み出した画像としても良い。

【００１３】本実施の形態によれば、大型の撮像装置とならざるをえない高感度撮像手段を蛍光観察用プローブ１１の手元側に設ける構成としたので、術者である医師が保持する内視鏡接眼部の大型化を一切招くことがなく、操作性を大きく向上することができる。また、通常観察は内視鏡先端部に設けられた撮像手段で光電変換するので、解像度が高い高画質な画像として得ることができ、かつ、蛍光観察用プローブもライトガイドが不要である分イメージガイドを太径化することができるので、蛍光観察画像も高画質な画像として得ることができる。さらに、光源装置内で通常観察用の白色光と蛍光観察用の励起光とを選択的に出射することができるので、装置の小型化も実現することができる。また、蛍光観察を併用する診断を行うにあたって、白色光と蛍光観察用の励起光とを選択的に出射可能な光源装置および蛍光観察用プローブのみを新規に用意すれば、内視鏡は通常のものを流用すれば良いので、きわめて汎用性の高い効率的な内視鏡システムを実現することができる。

【００１４】次に、本発明の光源装置の変形例を図３を参照して説明する。図３は、図１に示した光源装置の構成のみが異なるものである。

【００１５】図３の光源装置３１には、通常観察用の白色光を出射する白色光源ランプ３２、蛍光観察のための励起光としてのレーザ光を出射するレーザ光源３３が設けられている。光源ランプ３２は、キセノンランプ、ハロゲンランプ、メタルハライドランプ等が適している。また、レーザとして、ヘリウムカドミウムレーザ、色素レーザ、半導体レーザが挙げられる。白色光源ランプ３２とレーザ光源３３およびライトガイドファイバ３との間には、ミラー３４が配置されている。ミラー３４は、回転軸３５を中心に回動自在に構成されており、ミラー３４が図３に実線で図示されている状態に位置している場合にはレーザ光を出射し、破線で図示されている状態

に位置している場合には白色光を出射する。内視鏡1の操作部8に設けられた切換スイッチ9から出力される切換信号に対応して切換制御部7によって図示しない切換機構が動作され、ミラーの切換え動作が行われる。それ以外の作用、効果は、第1の実施の形態と同じである。

【0016】なお、切換スイッチ9は、内視鏡1の操作部8ではなく、光源装置4に設けても良い。あるいは、独立したスイッチとしても良く、内視鏡1に着脱自在な構成としても良い。また、2つのチャンネルを有する内視鏡を使用した場合には、そのうちの1つのチャンネル内に蛍光観察用プローブを挿入するとともに、もう1つのチャンネルに生検鉗子等の処置具を挿入して、蛍光観察下での処置を行うこともできる。また、内視鏡接眼部に撮像手段を設けた内視鏡とすることもできる。

【0017】以上詳述したように本発明の実施態様によれば、以下のような構成を得ることができる。

｜付記項1｜内視鏡と、この内視鏡の照明光伝送手段に体内組織に蛍光を発生せしめる励起光を出射可能な光源装置と、前記内視鏡のチャンネル内に挿通可能でその挿入部に光学像伝送手段を有するプローブと、このプローブの手元側に接続され前記光学像伝送手段から伝送された被写体像を撮像する高感度撮像手段と、を具備することを特徴とする内視鏡装置。

｜付記項2｜前記内視鏡は、挿入部先端部に撮像手段を有することを特徴とする付記項1に記載の内視鏡挿入。

｜付記項3｜前記光源装置は、白色光と励起光とを選択的に出射可能であることを特徴とする付記項1に記載の内視鏡装置。

｜付記項4｜前記高感度撮像手段と被写体との間にシャッタ手段を設けたことを特徴とする付記項1に記載の内視鏡装置。

｜付記項5｜切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記白色光と励起光との切換えを行う切換制御手段を設けたことを特徴とする付記項3に記載の内視鏡装置。

｜付記項6｜切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記シヤッタ手段の開閉を制御する切換制御手段を設けたことを特徴とする付記項4に記載の内視鏡装置。

｜付記項7｜前記内視鏡挿入部先端部に設けられた撮像手段からの撮像信号を処理してテレビジョン信号に変換する第1のビデオプロセス手段と、前記高感度撮像手段からの撮像信号を処理してテレビジョン信号に変換する第2のビデオプロセス手段を有するとともに、この第1および第2のビデオプロセス手段から出力されるテレビジョン信号を選択的に切換えてモニタTVに出力せしめる出力制御手段を設けたことを特徴とする付記項1に記載の内視鏡装置。

｜付記項8｜切換スイッチを設け、この切換スイッチから出力される切換信号に基づいて前記出力制御手段から出力されるテレビジョン信号を切り換えることを特徴とする付記項7に記載の内視鏡装置。

｜付記項9｜前記切換制御手段による前記白色光と励起光との切り換え制御、前記シヤッタ手段の開閉制御、前記出力制御手段から出力されるテレビジョン信号の切り換え制御のうちの少なくとも2つの制御を同期させて行うことを特徴とする付記項5、6および8に記載の内視鏡装置。

｜付記項10｜前記切換スイッチは、前記内視鏡の操作部に設けたことを特徴とする付記項5、6および8に記載の内視鏡装置。

【0018】

【発明の効果】以上説明したように本発明によれば、大型の撮像装置とならざるをえない高感度撮像手段を蛍光観察用プローブの手元側に設ける構成としたので、術者である医師が保持する内視鏡接眼部の大型化を一切招くことがなく、操作性を大きく向上することができる。また、蛍光観察用プローブはライトガイドが不要である分イメージガイドを太径化することができるので、蛍光観察画像を高画質な画像として得ることができる。さらに、蛍光観察を併用する診断を行うにあたって、蛍光観察用の励起光を出射可能な光源装置および蛍光観察用プローブのみを新規に用意すれば、内視鏡は通常のものを流用することができるので、きわめて汎用性の高い効率的な内視鏡システムを実現することができる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態の内視鏡装置の全体構成図。

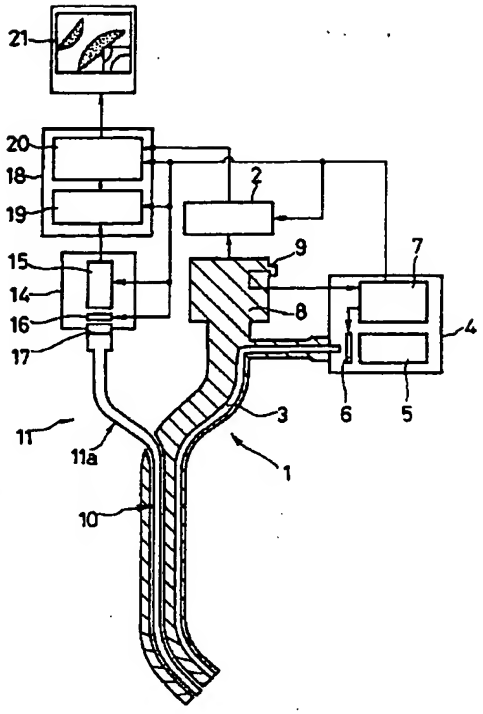
【図2】本発明の第1の実施の形態の蛍光観察用プローブの挿入部の断面図。

【図3】本発明の第1の実施の形態の光源装置の変形例を示す構成図。

【符号の説明】

1　内視鏡
4　光源装置
11　蛍光観察用プローブ
15　高感度撮像素子

【図1】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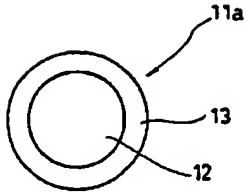
【図2】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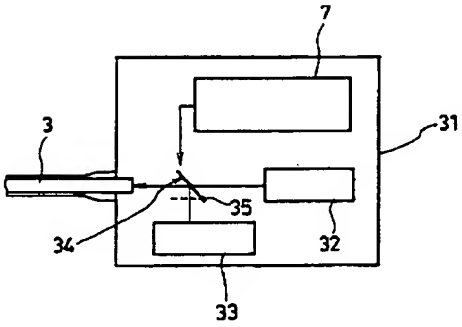
【図3】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